ENGINEERS
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OPERATIONS

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June 27, 2002

Ms. Denise M. Radtke
Senior Engineering Geologist
New York State Department of Environmental Conservation
Bureau of Solid and Hazardous Materials
625 Broadway, 8th Floor
Albany, New York 12233-7252

Re: Groundwater Performance Monitoring Report (August 2001)
CAMU Inspection Report (June 29, 2001)

Dear Ms. Radtke:

On behalf of our client, Wabash Aluminum Alloys, LLC (Wabash), this letter provides responses to the New York State Department of Environmental Conservation (NYSDEC) comments provided in a May 29, 2002 letter to Mr. Burt Coleman of Wabash (copy provided as Attachment A). The NYSDEC comments are associated with the revised Sampling and Analysis Plan provided by Wabash to NYSDEC in an April 8, 2002 submittal. Wabash's responses to NYSDEC's comments are provided below, in a format corresponding numerically with the NYSDEC comments. For brevity of presentation, the individual NYSDEC comments are not repeated in the text of this letter.

Responses to NYSDEC Comments

1.) Responses to the NYSDEC comments on the revised Sampling and Analysis Plan are provided below:

   1.) The requested statement is included in the revised plan.
   2.) The table is corrected as noted.
   3.) Section 3.3 is revised to indicate that well depths will be measured during each sampling event.
   4.) Section 3.4.1 is revised to indicate that the low-flow sampling pump is an American Sigma peristaltic pump, that dedicated tubing will be used for each well, and that samples will be collected in the order of volatilization potential. Based on the use of a peristaltic pump and dedicated tubing for each well, the requirement to progress from least to most contaminated wells does not appear to be appropriate. Details regarding metals field filtration have been added to the plan.

5.) Section 5.2 has been revised to state that samples will be placed on ice immediately after collection.
6.) Section 5.4 has been revised to state that the sample coolers will be within sight of the sampling team, or be kept in a secure location (locked) when not in sight.
7.) Page 3-3 of the O&M Plan has been revised to reflect the use of low-flow sampling techniques.
8.) An updated figure presenting monitoring well locations is included.

The revised Sampling and Analysis Plan, incorporating the above revisions, is included as Attachment B.

2.) When monitoring well MW-3 was destroyed during snow clearing operations in March 2001, the protective casing and upper one foot of riser pipe were sheared from the remainder of the well materials. In response to this comment from NYSDEC, Wabash attempted to locate the remnants of MW-3. While scraping the ground cover in the area of the monitoring well, the remainder of the riser pipe (approximately 30-inches) and flexible sampling hoses were unearthed. Photographs of the area showing the materials unearthed are provided in Attachment C.

As the photographs show, and as confirmed by depth to water measurements collected while the well was operational, the remaining well materials (approximately six feet of well screen, bentonite seal, and sandpack) all appear to be located below the water table. With the high water table conditions that exist in this area, it seems that no purpose would be served by unearthing the remainder of the well materials (i.e., there appears to be no potential for the remaining well materials to serve as a conduit for surface flow to enter the water table). Therefore, Wabash proposes to dispose of the already unearthed well materials, and to bring the ground surface in the area back to grade with the surrounding soils.

The remaining site monitoring wells are to remain in operation, and will be periodically inspected and maintained. Henceforth, any well taken out of operation will be properly decommissioned.

As stated in our April 8, 2002 letter, and previously requested by NYSDEC, the groundwater sampling will be continued on a quarterly basis. The next sampling event was to be scheduled after receiving NYSDEC approval of the revised sampling and analysis procedures. In order that the schedule not fall further behind, sampling for June 2002 has been conducted under the revised SAP, including those revisions outlined in this letter.

C&S COMPANIES

Thank you for your assistance in these matters. If you have any questions, please do not hesitate to contact Rory Woodmansee or me at (315) 455-2000.

Sincerely,

C&S ENGINEERS, INC.

Thomas A. Barba

Thomas A. Barba
Senior Project Scientist

cc: Burt Coleman – Wabash Aluminum Alloys, LLC
Michael E. Kellogg, Connell Limited Partnership
Rory Woodmansee – C&S Engineers
Mary Jane Peachey, NYSDEC-7

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ATTACHMENT A

NYSDEC Comment Letter

New York State Department of Environmental Conservation
Division of Solid and Hazardous Materials
Bureau of Solid Waste and Corrective Action, 8th Floor
625 Broadway, Albany, New York 12233-7258
Phone: (518) 402-8594 • **FAX:** (518) 402-9025
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

May 29, 2002

Mr. Burt Coleman
Plant Manager
Wabash Alloys, L.L.C.
6223 Thompson Road
P.O. Box 639
East Syracuse, New York 13057-0639

Dear Mr. Coleman:

Re: Groundwater Performance Monitoring Report

The New York State Department of Environmental Conservation (Department) has completed a review of your letter, dated April 8, which responds to Department comments on the Groundwater Performance Monitoring Report (dated August, 2001). Comments are presented below.

1) Wabash has provided a revised Sampling and Analysis Plan (Appendix D) to be used in conjunction with the approved June 1997 Operations and Maintenance Plan. Comments on the revised Appendix D are presented in the enclosure.

2) In a letter from the Department, dated February 25, the following comment was presented:

"It has been brought to our attention that monitoring wells MW-8, MW-9 and MW-10 were recently destroyed during installation of the concrete cap in the scrap yard area, and that monitoring well MW-3 was destroyed during snow removal activities. In the future, it is expected that facility monitoring wells that are damaged or taken out of service will be properly decommissioned. Wells are to be decommissioned in accordance with the NYSDEC guidance entitled "Groundwater Monitoring Well Decommissioning Procedures" (October 1996). Decommissioning procedures are also included in the approved Operations and Maintenance Plan (June 1997). Any plans for the decommissioning of specific wells should be approved by the Department prior to decommissioning. Since MW-8, MW-9 and MW-10 are now covered by the scrap yard cap, it will not be necessary to attempt to decommission these wells at this time. Wabash should attempt to properly decommission MW-3 as soon as possible. There are currently five additional (operational) wells that were installed at the direction of the Division of Water during the Spring of 2000. Wabash should consider if some of these wells should remain operational for possible future sampling. Wells which are to remain in operation should be inspected at least semi-annually, and properly maintained (including appropriate flagging and guard structures to prevent damage by vehicular traffic). Wells which are not kept in operation must be properly decommissioned as soon as possible."

Wabash has not adequately addressed the concerns presented in this comment. Wabash must submit a plan for the proper decommissioning of MW-3. Wabash should also indicate which of the remaining Division of Water monitoring wells will be kept in operation. If any of these wells are to be decommissioned in the near future, the decommissioning plan should be submitted along with the plan for MW-3.

Please provide a response to this letter by June 28. Your response should include a Sampling and Analysis Plan that has been revised in accordance with the comments presented in the enclosure.

If you have questions concerning this letter, you may contact me at (518) 402-8594.

Sincerely,

Denise M. Radtke

Denise M. Radtke
Senior Engineering Geologist

Enclosure

cc: E. Miles
R. Murphy
M. J. Peachey
P. Patel
L. Gross
W. McCarthy
J. Reidy

Enclosure

1) Section 2.1 - This Section of the June 1997 Plan included the following statement:

"Every five years, beginning with the first round of sampling, the laboratory will be required to provide ASP Category B deliverables. Third party validation will be conducted on the ASP deliverable packages. The validator's reports will be submitted to the NYSDEC. The deliverables from the laboratory for all other samples collected will include a report narrative and items A, B and C on Table I-1."

This statement must be included in the revised plan. A copy of Table I-1 is attached.

2) Table 2-1 - This table should be corrected as follows:

Lead Analysis (total and soluble):

- Add well B-290
- Delete B-291
- Replace B-293 with well B-404

Barium Analysis (total and soluble):

- Delete well B-307

PCB Analysis:

- Replace well B-293 with well B404

Please note that well B-293 was decommissioned in 1998, and well B-404 was installed as a replacement in September 1998. Well B-307 was decommissioned in July 1998, and replacement of this well was not required.

3) Section 3.3 - Please indicate that the depth of the well will also be measured each time water level measurements are collected. Well depth measurements may be collected following purging and sampling to minimize disturbance to the formation prior to sampling.

4) Section 3.4.1 - Please indicate the specific type of pump that will be used for the low flow purging and sampling. Indicate if dedicated pumps will be used for each monitoring well, or if one pump will be cleaned in the field between each well. Indicate that samples will be collected in order of volatilization potential of the parameters to be analyzed (PCBs followed by metals). Indicate that the order of well sampling will progress from the least contaminated well to the most contaminated well. Provide details on the procedures for collecting filtered and unfiltered metals samples.

5) Section 5.2 - The plan should state that samples will be placed on ice immediately after sample collection.

6) Section 5.4 - The description of chain of custody procedures should state that the sample coolers will be within site of the sampling team, or be kept in a secure location (locked) when not within site.

7) Page 3-3 of the Operations and Maintenance Plan refers to the use of bailers for sampling. This page should also be revised to reflect the use of low-flow sampling techniques.

8) Please include an updated figure which presents the monitoring well locations and site features.

ATTACHMENT B

Revised Sampling and Analysis Plan (Appendix D to the June 1997 Operations and Maintenance Plan)

SAMPLING AND ANALYSIS PLAN

WABASH ALUMINUM ALLOYS, LLC
East Syracuse, New York

November 1996
Finalized June 1997
Revised June 2002

C&S ENGINEERS, INC.
Syracuse Hancock International Airport
North Syracuse, New York13212

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1.0 INTRODUCTION

1.1 GENERAL

This Sampling and Analysis Plan was originally developed in 1997 for the Roth Bros. Smelting Corp. (Roth Bros.) located in East Syracuse, New York. The present owner and operator of the plant is Wabash Aluminum Alloys, LLC. The sampling is being conducted to evaluate the effectiveness of the corrective actions conducted at the site and to monitor groundwater in the vicinity of Plant #1 for barium. The plan was updated in 2002 to incorporate changes in monitoring locations and groundwater sampling procedures.

1.2 PROJECT ORGANIZATION AND MANAGEMENT

The subsections below identify the key personnel working on this project that have quality assurance responsibilities.

1.2.1 Quality Assurance Manager

Christen Craig of C&S Engineers, Inc. (C&S), is the Quality Assurance Manager for the groundwater sampling. The Quality Assurance Manager is responsible for ensuring that all of the appropriate procedures in this Sampling and Analysis Plan are followed and that proper documentation is maintained. Ms. Craig will also serve as the coordinator of analytical services for this project. She will confirm that the laboratory is aware of the analytical requirements for this project prior to sample submission and she will also handle all communications and correspondence with the laboratory. The Quality Assurance Manager is responsible for overseeing the review and evaluation of analytical data, ensuring that chemical testing is performed in accordance with agreed upon procedures.

1.2.2 Boring Program & Sampling and Equipment Coordinator

John Holmquist (C&S), Project Hydrogeologist, will be the boring program coordinator. He will coordinate all activities with the drilling subcontractor. In addition, Mr. Holmquist will serve as the sampling and equipment coordinator for field services needed as part of the groundwater-monitoring program. He will be responsible for ensuring that the proper procedures, containers and preservatives are utilized. In addition, Mr. Holmquist will be responsible for ensuring that all field equipment is in operable condition and calibrated, and that all chain-of-custody and other record-keeping procedures are completed. Field records will be kept in a bound field book. All information will be recorded in ink and each page of the field log will be signed by the record keeper. Information that will be recorded will include the following: date, time, samplers name, location, weather conditions, general observations/remarks, sample description and identification, field measurements (depth of well, depth to water, pH, temperature, conductivity, and turbidity).

1.3 SAMPLING & ANALYSIS PLAN ORGANIZATION

Section 2 of this plan discusses the analytical requirements for the groundwater samples collected. The sampling procedures that will be used are discussed in Section 3. Section 4 describes the soil boring log description procedures that will be used. The requirements for maintaining sample integrity are discussed in Section 5. Section 6 includes field instrument calibration and maintenance procedures.

2.0 SAMPLING & ANALYSIS

2.1 SAMPLING AND ANALYSIS

Analytical testing will be conducted on groundwater samples collected from ten monitoring wells. The sampling locations, the frequency of sampling, and the analyses to be conducted are specified in the Operations & Maintenance Plan. Sampling will be conducted in accordance with procedures specified in Section 3 of this Sampling and Analysis Plan.

As discussed in the Operations & Maintenance Plan, parameters that will be analyzed include arsenic, barium, lead, and PCBs. Table 2-1 presents the frequency of analyses, the analytical methods, the target quantitation limits, the sampling locations, the action limits, the number and type of QA/QC samples, and the required laboratory deliverables. Analysis of samples will be conducted by a New York State Department of Health ELAP approved laboratory.

Every five years, beginning with the first round of sampling, the laboratory will be required to provide ASP Category B deliverables. Third party validation will be conducted on the ASP deliverable packages. The validator's reports will be submitted to the NYSDEC. The deliverables from the laboratory for all other samples collected will include a report narrative and items A, B, and C on Table I-1.

2.2 QUALITY ASSURANCE SAMPLES

Duplicate or split samples will be collected for quality assurance purposes. Locations of the duplicates will be determined in the field upon consideration of such factors as sample size and well recovery rates. Quality assurance samples are discussed in Section 3 of this Plan.

TABLE 2-1
GROUNDWATER SAMPLING PROGRAM
WABASH ALUMINUM ALLOYS

Sampling Frequency	Analyte	Analytical Method	Quantitation Limit (ug/l)	Sampling Locations	No. of Samples	No. and type of QA/QC Samples
Quarterly	As (total and soluble)	6010	4	B280, B281	2	1MS 1FB 1D 1EB
	Pb (total and soluble)	6010	2	B280, B281,B290, B401, B402, B403, B404	7	
	Ba (total and soluble)	6010	300	B107, B108, B281	3	
	PCBs	8082	0.05	B280, B402, B403, B404	4	1MS, 1MSD, 1D

Notes: (1) Locations of Monitoring Wells Are Provided on Figure 1
(2) QA/QC Sample Designations:
D = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
EB = Equipment Blank
FB = Filter Blank
(3) Digestion Method: ICP - 3010

3.0 GROUNDWATER SAMPLING PROCEDURES

3.1 INTRODUCTION

In order to assess the effect of the site waste materials on groundwater quality, the behavior of pollutants in the subsurface environment and the processes governing this behavior must be evaluated. The fundamental objective of monitoring is to serve as a check on potential groundwater contamination. The subsurface environment, however, is an extremely complex system, subject to extensive physical, chemical and biological changes within small vertical and horizontal distances. Samples from a monitoring well represent a small part of an aquifer horizontally and in many cases, vertically. Special precautions must be taken to ensure that the sample taken from a given well is representative of the groundwater at that location and that the sample is neither altered nor contaminated by the sampling and handling procedure.

The following subsections detail the procedures to be followed by field personnel in monitoring groundwater for the Operations and Maintenance Plan for Wabash Aluminum Alloys LLC. These procedures are based on USEPA Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures (EPA/540/S-95/504). A copy of this USEPA guidance document is provided as Appendix E. The NYSDEC contact will be notified prior to any deviation from the procedures presented in this plan.

3.2 REPRESENTATIVE SAMPLE COLLECTION

During any groundwater sampling program, it must be understood that the composition of the water within the well casing and in close proximity to the well is probably not representative of the overall groundwater quality at that sampling site. This is due to the possible presence of drilling contaminants near the well and because important environmental conditions such as pH and oxidation-reduction potential may differ drastically near the well from the conditions in the surrounding water-bearing materials. Stagnation as well as stratification of water can take place within the well. Disturbance and resuspension of settled solids within the well column are another reason that groundwater samples may not be representative of actual aquifer quality.

The following sections describe methods to safeguard against collecting non-representative water in a sample by employing low flow (minimal drawdown) sampling techniques.

3.3 WATER LEVEL ELEVATIONS

Valuable hydrogeological data can be obtained from the periodic monitoring of water level elevations in the groundwater monitoring system at a site. This information is necessary for the determination of the flow and direction of groundwater and to monitor seasonal changes in the groundwater elevation in the area. At a minimum, water level elevations will be taken at each sampling occurrence.

Water level measurements are made using an electronic water level indicator. Depths are measured from the top of the well casing to the water surface. These measurements are converted to elevations (above mean sea level) using a survey elevation of the well casing.

During each sampling event, each well depth shall also be measured. To minimize disturbance to the formation prior to sampling, the well depth measurement should be collected following purging and sampling. Measurements should be accurate to ~0.0l foot.

3.4 COLLECTION OF GROUNDWATER SAMPLES – PROCEDURES

The following subsections describe procedures to be used for sampling groundwater-monitoring wells. The procedures are adapted from USEPA guidance manual EPA/540/S-95/504 (Appendix E).

Prior to the use of any of these procedures, the following steps should be completed.

- Put on the necessary personal protective equipment and a new pair of disposable gloves.

- Ensure that all sampling and monitoring equipment have been properly decontaminated prior to use.

- Unlock the well and remove the inner protective cap. Place this in a location that will not contribute contamination to the well when it is replaced.
- Using the pre-cleaned electric well depth probe, measure the depth to the water surface in the well (to 0.01 foot) from the top of the internal well casing.

- Record depth information in ink in a bound field notebook.

3.4.1 Purging and Sampling Monitoring Wells with a Low-Flow Device

Prior to purging and sampling, purging/sampling devices and monitoring equipment should be calibrated according to the manufacturer's recommendations. A low-flow pump capable of maintaining groundwater removal rates of 0.1 L/min to 0.5 L/min will be used during both purging and sampling to maintain minimal drawdown (<0.5 meters) in the well. The following guidelines should be considered during purging and sampling:

- Maximize tubing wall thickness, minimize tubing length;

- Place the sampling device intake at the desired sampling point;

- Minimize disturbances of the stagnant water column above the screened interval during water level measurement and sampling device insertion;

- Make proper adjustments to stabilize the flow rate as soon as possible; and

- Monitor water quality indicators (pH, temperature, conductivity, turbidity) during purging.

The pump or tubing should be slowly lowered to the middle of the screened interval to minimize disturbance of the water and solids in the well casing. Once a flow rate has been established that achieves a steady drawdown of 0.5 meters or less, the indicator parameters of pH, conductivity, and turbidity should be measured at five-minute intervals. After a minimum of three well volumes of groundwater have been removed from the monitoring well, and two successive measurements of all three indicator parameters differ by less than 10%, the groundwater samples may be collected. If indicator parameters do not stabilize after removal of five well volumes of groundwater, or if low-flow conditions cannot be maintained (i.e., water level in the well declines to the pump intake level), groundwater samples will be collected after the monitoring well recovers. Notes on the field sampling log should then describe the conditions observed during the sampling, and the subsequent report will recommend appropriate corrective measures (e.g., redevelop the well to remove suspended solids).

The specific pump to be used during the sampling shall be an *American Sigma* peristaltic pump. Dedicated tubing will be utilized for each well sampled. The samples will be collected in the order decreasing volatilization potential at each well (PCBs followed by metals). Filtered metals samples will be collected in the field using a hand-powered vacuum pump, with dedicated tubing for each well, to force the sample water through a 0.4 micron filter into the sample container.

4.0 SOIL BORING LOG DESCRIPTION PROCEDURES

4.1 GENERAL

This procedure is presented as a means for insuring proper field identification and description of soils collected from a split barrel sampler according to American Standard Testing Method (ASTM) D 1586, "Penetration Test and Split Barrel Sampling of Soils" (See Appendix B). The lithology and moisture content of each soil sample can be visually and physically characterized according to either the Burmister Soil Classification System or the Unified Soil Classification System. Both of these methods of soil classification describe soil types on the basis of grain size and liquid and plastic limits and include moisture content.

4.2 DATA RECORDING FORMS

Enter all data pertaining to the soil descriptions on the Field Borehole Log. Write the dominant particle size in capital letters. Record additional notes such as water loss or gain, drill chatter, odor, etc.

Maintain a daily drilling report indicating the day's drilling activities. This latter report will include all drilling starting and ending times, footage drilled, consumables and any other important notes about the day's drilling process.

4.3 SOIL BORING SAMPLING AND BOREHOLE LOGS

- Maintain a daily drilling report describing the day's activities in addition to the field borehole log.

- With the split-spoon sample barrel resting on the bottom of the borehole, the entire length of the sampler (24 inches) is driven into the sub-soil by a 140 lb. weight free falling from a height of 30 inches.

- Record the number of blows necessary to drive the sampler six inches on the borehole log sheet as blow counts. If the sampler is not driven the six-inch interval after 100 blows are delivered, measure the penetration distance for that interval.

TABLE 4-1

KEY TO SOILS IDENTIFICATION
Burmister Classification

Granular Soils - Particle Size Classification

Material		Fractions	Passing	Retaines On
BOULDERS	Material retained on the 9 in. sieve			9 in.
COBBLES	Material passing the 9 in. sieve and retained on the 3 in. sieve		9 in.	3 in.
GRAVEL	Material passing the 3 in. sieve and retained on the No. 10 sieve	coarse (c) medium (m) fine (f)	3 in. 1 in. 3/8 in.	1 in. 3/8 in. No. 10
SAND	Material passing the No. 10 sieve and retained on the No. 200 sieve	coarse (c) medium (m) fine (f)	No. 10 No. 30 No. 60	No. 30 No. 60 No. 200
SILT	Material passing the No. 200 sieve that is nonplastic in character and exhibits little or no strength when air-dried		No. 200	

Clay Soils - Plasticity Classification

Material*	Degree of Over-all Plasticity	Overall Plasticity Index Sand - Silt - Clay Components
Clayey SILT	Slight	1 to 5
SILT & CLAY	Low	5 to 10
CLAY & SILT	Medium	10 to 20
Silty CLAY	High	20 to 40
CLAY	Very High	40 and greater

*Soils passing the No. 200 sieve which can be made to exhibit plasticity and clay qualities within a certain range of moisture content, and which exhibits considerable strength when air-dried.

Penetration Resistance and Soil Properties on Basis of the Standard Penetration Test (After Peck, Hanson and Thornburg, 1974)

Sands (Fairly Reliable)		Clays (Rather Unreliable)	
Number of Blows per ft. N	Relative Density	Number of Blows per ft. N	Consistency
		Below 2	Very Soft
0-4	Very Loose	2-4	Soft
4-10	Loose	4-8	Medium
10-30	Medium	8-15	Stiff
30-50	Dense	15-30	Very Stiff
Over 50	Very Dense	Over 30	Hard

Terms Identifying Composition of Soil

Written*	Defining Range of Percentage by Weight
and	35 to 50
some	20 to 35
little	10 to 20
trace	0 to 10

*Plus (+) or minus (-) sign used after identifying term denotes extremes of range, e.g., "some (-) Gravel" indicates 20 to 24 percent Gravel; "some (+) Gravel" indicates 31 to 35 percent Grave.

AA03088/FORMS

FOIL208089

TABLE 4-2

SOIL TERMS

UNIFIED SOIL CLASSIFICATION (USCS)

COARSE GRAINED SOILS

More than half of material is LARGER than No. 200 sieve size

		FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3" & basing fractions on estimated weights)	GROUP SYM-BOLS	TYPICAL NAMES
GRAVELS 50%(+)> 1/4" ϕ	CLEAN GRAVELS Low % fines	Wide range in grain size and substantial amounts of all intermediate particle sizes	GW	Well graded gravels, gravel-sand mixtures, little or no fines
		Predominantly one size or a range of sizes with some intermediate sizes missing	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
	GRAVELS W/FINES High % fines	Non-plastic fines (for identification procedures see ML)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures
		Plastic fines (for identification procedures see CL)	GC	Clayey gravels, poorly graded gravel-sand-clay mixtures
SANDS 50% (+) < 1/4" ϕ	CLEAN SANDS Low % fines	Wide range in grain size and substantial amounts of all intermediate particle sizes	SW	Well graded sand, gravelly sands, little or no fines
		Predominantly one size or a range of sizes with some intermediate sizes missing	SP	Poorly graded sands, gravelly sands, little or no fines
	SANDS W/FINES High % fines	Non-plastic fines (for identification procedures see ML)	SM	Silty sands, poorly graded sand-silt mixtures
		Plastic fines (for identification procedures see CL)	SC	Clayey sands, poorly graded sand-clay mixtures

FINE GRAINED SOILS

More than half of material is SMALLER than No. 200 sieve size.

	FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3" & basing fractions on estimated weights)			GROUP SYM-BOLS	TYPICAL NAMES
	Identification procedures on fraction smaller than No. 40 sieve size				
	DRY STRENGTH (Crushing Characteristics)	DILATANCY (Reaction to Shaking)	TOUGHNESS (Consistency Near Plastic Limit)		
SILTS & CLAYS Liquid limit < 50	None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity
	Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	Slight to medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity
SILTS & CLAYS Liquid limit > 50	Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays
	Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS	Readily identified by color, odor, spongy feel and frequently by fibrous texture			Pt	Peat and other organic soils

Boundary classifications-Soils possessing characteristics of two groups are designated by combining group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.
All sieve sizes on this chart are U.S. standard.

DENSITY OF GRANULAR SOILS

DESIGNATION	STANDARD PENETRATION RESISTANCE – BLOWS/FOOT
Very loose	0 - 4
Loose	5 - 10
Medium dense	11 - 30
Dense	31 - 50
Very dense	Over 50

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNC. COMPRESSIVE STR. TONS /SQ. FT.	STANDARD PENETRATION RESISTANCE – BLOWS/FOOT	FIELD IDENTIFICATION METHODS
Very soft	Less than 0.25	0 to 2	Easily penetrated several inches by fist
Soft	0.25 to 0.50	2 to 4	Easily penetrated several inches by thumb
Medium stiff	0.50 to 1.0	4 to 8	Can be penetrated several inches by thumb
Stiff	1.0 to 2.0	8 to 15	Readily indented by thumb
Very stiff	2.0 to 4.0	15 to 30	Readily indented by thumbnail
Hard	More than 4.0	Over 30	Indented with difficulty by thumbnail

ROCK TERMS

ROCK HARDNESS (FROM CORE SAMPLES)

DESCRIPTIVE TERMS	SCREWDRIVER OR KNIFE EFFECTS	HAMMER EFFECTS
Soft	Easily gouged	Crushes when pressed with hammer
Medium soft	Can be gouged	Breaks (one blow) Crumbly edges
Medium hard	Can be scratched	Breaks (one blow) Sharp edges
Hard	Cannot be scratched	Breaks conchoidally (several blows) Sharp edges

ROCK BROKENNESS

DESCRIPTIVE TERMS	ABBREVIATION	SPACING
Very broken	(V. Br.)	0 - 2"
Broken	(Br.)	2" - 1'
Blocky	(Bl.)	1' - 3'
Massive	(M.)	3' - 10'

LEGEND

SOIL SAMPLES - TYPES

S - 2" O.D. Split Barrel Sample
ST - 3" O.D. Undisturbed Sample
O - Other Samples, Specify in Remarks

ROCK SAMPLES - TYPES

X - NX (Conventional) Core (~ 2-1/8" O.D.)
Q - NQ (Wireline) Core ~1-7/8" O.D.)
Z - Other Core Sizes, Specify in Remarks

WATER LEVELS

12/18
∇ 12.6' Initial Level w/Date & Depth
12/18

FOIL208090

- After the split-spoon is pried open with a screwdriver, measure and record the length of the sample, the upper 2 to 3 inches of the sample should be neglected since this material will consist of unrepresentative material sludge.

- Shave a thin layer off the entire length of the sample to prevent descriptive errors that may result from smearing of the outer sample surface while the sample barrel is being driven.

4.4 DESCRIPTIVE TERMS FOR SOIL CHARACTERISTICS

Use the following terms to identify major characteristics of the soils:

- Color. Describe soil color utilizing a single color descriptor preceded by a modifier to denote variations in shade or color mixtures. Soil color should be described while the sample is still moist.

- Density. Classify the relative density of a soil according to the number of blow counts from the standard penetration test while sampling:

Designation	Blows per Foot
Very loose	0 to 4
Loose	5 to 10
Med. dense	11 to 30
Dense	31 to 50
Very dense	Over 50

- Particle Size. Base particle size classification upon the grain sizes in the Burmister and Unified Soil Classification Systems (See Tables 4-1 and 4-2).

- Soil Descriptors. Describe the relative weight proportions of each soil sample using terms as: and, some, little or trace. Each term represents a range of percentage by weight. See the Burmister Classification System for further details (Table 4-1).

- Moisture Content. Estimate moisture content according to four categories: dry, moist, wet and saturated. In dry soil, there appears to be little or no water. Saturated samples contain more water than the soil can hold. Moist and wet are used to describe samples that contain more or less water than these two extremes. The application of these terms is subjective, but if consistency is used throughout the drilling project, they will prove to be adequate.

5.0 SAMPLE INTEGRITY

5.1 EQUIPMENT CLEANING

Contamination of samples is avoided by proper cleaning of sampling equipment and containers prior to their use in the field, or by the utilization of dedicated equipment. The actual cleaning process is dictated by the analytical procedures designated for the sample, but usually includes the following steps:

- Detergent washing
- Rinse with tap water
- Rinse with a dilute nitric acid solution (inorganics only)
- One or more rinses with distilled water.

The cleaning is performed prior to going out in the field. When discrete samples are to be collected at multiple locations, additional cleaning between samples is performed on-site to prevent carry-over of contaminants. During sampling, equipment is not allowed to come in contact with the ground, other equipment, or potential sources of contamination.

The use of dedicated equipment is optimal for projects where a long-term monitoring program is in place, or where protection from contamination is not adequate through the use of normal cleaning procedures. In this application, tubing serving a low-flow sampling device will be used in only one well and either labeled, protected and stored between sampling events, or disposed.

5.2 CONTAINERS, PRESERVATIVES AND HOLDING TIMES

Sample integrity is preserved through the use of proper sample containers, addition of the correct preservatives to the samples and meeting designated holding times (the time from sample collection to sample analysis). Samples will be placed on ice immediately after sample collection. Containers, preservatives and holding times used are taken from 40 CFR Part 136 and are shown in Appendix D.

5.3 QUALITY CONTROL SAMPLES/DUPLICATE AND SPLIT SAMPLES

Duplicate samples are multiple samples collected at the same time, from the same location and using the same procedure and containers. These samples provide a check on any variability introduced during the sampling process. Split samples are one sample that is divided into two or more aliquots. The aliquots may then be sent to separate laboratories as a check on analytical results, or one of the aliquots may be assigned a fictitious number and submitted to the same laboratory as a "blind split". This "blind split" is a check on the analytical variability within the laboratory. One blind split sample will be submitted to the laboratory per sampling event. This sample is collected by pouring equal amounts of groundwater from the same monitoring well into two sample containers. The process is repeated until the sample bottles are fill. The blind split location will be selected in the field and is dependent on recharge rates of the monitoring wells.

5.4 CHAIN-OF-CUSTODY

An important part of quality control is proper documentation of all aspects of the sampling program. This includes careful labeling of the sample containers, the use of bound field books to record pertinent data on-site during sampling events and the use of chain-of-custody sheets, which accompany the sample from collection through analysis. Self-stick labels should provide spaces to record client name, sample location, date and time of sampling, sampler's name, filtered or not, preservatives added, and sample ID.

The chain-of-custody (COC) sheet should include all the information from the label, and in addition: sample type, sampling method, number and type of containers, name, date and time of delivering and receiving the sample at the laboratory, and the date, method and person performing each sampling. Typical COC documents are included in Appendix C of this report. Care should be taken to avoid the use of inks that run when wetted. Sample coolers will be kept within sight of the sampling team, or be kept in a secured location (locked) when not in sight.

6.0 FIELD INSTRUMENT CALIBRATION AND MAINTENANCE

6.1 INTRODUCTION

Calibration and maintenance procedures for the field instruments identified below are presented in the following sections.

6.2 PORTABLE FIELD pH METER

6.2.1 Accuracy

The calibrated accuracy of the pH meter will be 0.1 pH unit over the temperature range of-2^0C to 40^0C.

6.2.2 Calibration

The pH meter will be calibrated by immersing the sensing probe in a container of certified pH buffer solution traceable to the National Bureau of Standards. The meter reading will be compared to the known value of the buffer solution, which is. stirred. The meter will be two-point calibrated in the field at the beginning and end of each group of measurements. Precalibration at the office will be performed for local jobs.

6.2.3 Maintenance

- When not in use or between measurements, the pH probe will be kept immersed in or moist with buffer solution.

- The meter batteries will be checked at the beginning and end of each day and replaced when needed.

- The pH probe will be replaced any time that the meter response time becomes greater than two minutes or the metering system consistently fails to retain its calibrated accuracy for a minimum often sample measurements.

- If replacement of the pH probe fails to resolve instrument response time and stability problems, the instrument will be sent to the manufacturer for maintenance and repair.

- A maintenance log will be kept for each pH monitoring instrument. All maintenance performed on the instrument will be recorded on this log with date and name of the organization performing the maintenance.

6.2.4 Data Verification

All instrument calibrations will be documented; indicating the meter readings before and after the meter has been adjusted. The pH buffers used to calibrate the meter will also be documented. This is important, not only for data verification, but also to establish maintenance schedules and component replacement.

6.3 PORTABLE FIELD CONDUCTIVITY METER

6.3.1 Accuracy

The calibrated accuracy of the specific-conductance meter will be within three percent of full-scale over the temperature range of-2^0C to 40^0C.

6.3.2 Calibration

The specific-conductance meter will be calibrated by immersing the sensor in a container of potassium-chloride standard solution and comparing the meter reading with the known value of the standard solution. The potassium-chloride solution will be prepared in accordance with Standard Methods for the Examination of Water and Wastewater, seventeenth edition, 1989, Part 205 or a purchased standard solution will be used. Alternate calibration techniques recommended by the manufacturer for use with a particular meter may substitute for the above procedure.

6.3.3 Maintenance

- The meter batteries will be checked at the beginning and end of each day and replaced when needed.

- The meter response time and stability will be tracked to determine the need for instrument maintenance. When response time becomes greater than two minutes and the meter must be recalibrated more than once per day, the instrument will be sent to the manufacturer for maintenance and repair.

- A maintenance log will be kept for each specific-conductance meter. An maintenance performed on the instrument will be recorded on this log with date and name of the organization performing the maintenance.

6.3.4 Data Verification

All instrument calibrations will be documented, indicating the meter readings before and after the meter has been adjusted. The standard solution used to calibrate the meter will also be documented.

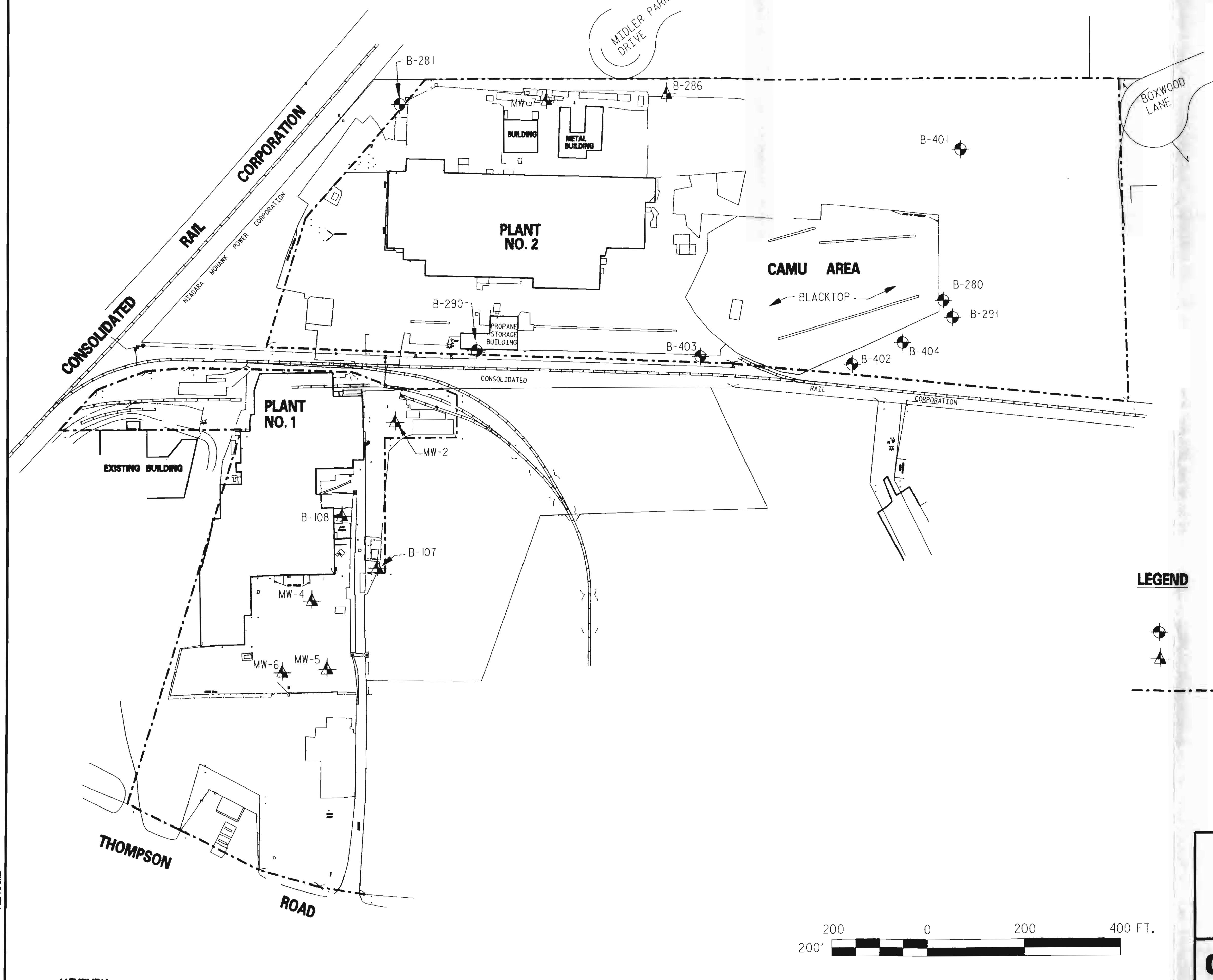
6.4 PORTABLE TURBIDMETER

Any turbidimeters used during groundwater purging and sampling must provide:

- Range settings to allow measurements from 0 to 100 NTU;
- Readability of 0.01 NTU on lowest range setting;
- Repeatability of ± 1% of full scale;
- Linearity better than 2% on all range scales.

The operating manual for a Hoch Portable Turbidimeter is included as Appendix F to this Sampling and Analysis Plan.

FIGURES



LEGEND

- MONITORING WELL USED FOR GROUNDWATER PERFORMANCE MONITORING
- ADDITIONAL SITE MONITORING WELL
- WABASH ALUMINUM ALLOYS,LCC PROPERTY BOUNDARY

WABASH ALUMINUM ALLOYS, LLC
GROUNDWATER PERFORMANCE MONITORING

SITE PLAN

C&S Engineers, Inc.

DATE:
SCALE: 1" = 200'
FILE NO. 868.004.001-240

FIGURE 1

SYTIME

REFNAME